

## CLAIMS

What is claimed is:

1. A method for measuring the thickness of a coating layer on a substrate between the substrate and a fluid so as to create a fluid/coating interface and a coating/substrate interface, the method comprising the steps of:

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(a) transmitting a signal comprising a broad band of ultrasonic frequencies to the coating layer using a transducer so that a backscattered signal is reflected from the fluid/coating interface, and a trailing signal is reflected from the coating/substrate interface and the trailing signal reaches the transducer after a time delay relative to the backscattered signal;

(b) discriminating between the backscattered and trailing signal based on said time delay such that only the trailing signal from the coating layer/substrate interface is processed;

(c) deconvolving the trailing signal into a set of frequencies;

(d) measuring the amplitude of each frequency of the returning trailing signal;

(e) determining the resonant frequency of the coating layer as the frequency with the greatest amplitude; and

(f) calculating the thickness of the coating layer using the resonant frequency.

2. The method according to claim 1, wherein said ultrasonic frequencies include a main transmitting frequency and further comprising the steps of:

obtaining at least one reference signal from the front surface of the coating layer (S2);

comparing it with the trailing signal; and

using the reference signal in deconvolving signal artifacts from the trailing signal attributable to the main transmitting frequency of the ultrasonic frequencies.

3. The method according to claim 1, wherein the trailing signal has a resonant frequency and an ultrasonic velocity associated with the coating layer and said step (f) is carried out by using a combination of the resonant frequency and the velocity of the trailing signal.

4. An apparatus for measuring the thickness of a coating layer having a resonant frequency and being deposited on a substrate between the substrate and a fluid so as to create a fluid/coating interface and a coating/substrate interface, said apparatus comprising:

a transducer for directing a transmitted signal comprising a broad band of frequencies towards the coating layer;

a signal receiving means for receiving a backscattered signal from the fluid/coating interface and a trailing signal from the coating/substrate interface after a time delay relative to said backscattered signal; and

a signal processing means, operably associated with said signal receiving means, for establishing a signal processing window based on said time delay such that only the trailing signal is processed and for (i) measuring an amplitude of each frequency component of the trailing signal, (ii) determining the resonant frequency of the coating layer as the frequency component with the greatest amplitude, and (iii) calculating a thickness of the coating layer using the resonant frequency so determined.

5. The apparatus according to claim 4, wherein said signal receiving means is part of and located within said transducer.

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6. The apparatus according to claim 4, wherein said signal receiving means is separate from said transducer.

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